



## Internalisation of external cost in the power generation sector: Analysis with Global Multi-regional MARKAL model

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### Abstract:

The Global MARKAL-Model (GMM), a multi-regional "bottom-up" partial equilibrium model of the global energy system with endogenous technological learning, is used to address impacts of internalisation of external costs from power production. This modelling approach imposes additional charges on electricity generation, which reflect the costs of environmental and health damages from local pollutants (SO<sub>2</sub>, NO<sub>x</sub>) and climate change, wastes, occupational health, risk of accidents, noise and other burdens. Technologies allowing abatement of pollutants emitted from power plants are rapidly introduced into the energy system, for example, desulphurisation, NO<sub>x</sub> removal, and CO<sub>2</sub> scrubbers. The modelling results indicate substantial changes in the electricity production system in favour of natural gas combined cycle, nuclear power and renewables induced by internalisation of external costs and also efficiency loss due to the use of scrubbers. Structural changes and fuel switching in the electricity sector result in significant reduction of emissions of both local pollution and CO<sub>2</sub> over the modelled time period. Strong decarbonisation impact of internalising local externalities suggests that ancillary benefits can be expected from policies directly addressing other issues than CO<sub>2</sub> mitigation. Finally, the detailed analysis of the total generation cost of different technologies points out that inclusion of external cost in the price of electricity increases competitiveness of non-fossil generation sources and fossil power plants with emission control. © 2006 Elsevier Ltd. All rights reserved.

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### Resource Description

#### Exposure :

weather or climate related pathway by which climate change affects health

Air Pollution, Unspecified Exposure

#### Geographic Feature:

resource focuses on specific type of geography

None or Unspecified

#### Geographic Location:

resource focuses on specific location

# Climate Change and Human Health Literature Portal

Global or Unspecified

## **Health Impact:**

specification of health effect or disease related to climate change exposure

Health Outcome Unspecified

## **Mitigation/Adaptation:**

mitigation or adaptation strategy is a focus of resource

Mitigation

## **Model/Methodology:**

type of model used or methodology development is a focus of resource

Cost/Economic, Methodology

## **Resource Type:**

format or standard characteristic of resource

Policy/Opinion, Research Article

## **Timescale:**

time period studied

Medium-Term (10-50 years)